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DescriptionCROSS FLOW FAN5 Technical Field

This invention relates generally to a fan for a cleaning system of an agricultural combine, and more particularly, to a cross or transverse flow fan which provides a relatively high air flow volume at a relatively lower cost than other known cross flow fans for combine cleaning systems.

Background Art

A typical agricultural combine includes a crop header apparatus which reaps planted grain stalks and then feeds them to a threshing apparatus arranged within a body of the combine. The threshing apparatus functions to separate grain from material other than grain. The grain falls through openings in the threshing apparatus and is directed to a cleaning system also arranged within the combine body.

A typical cleaning system includes oscillating cleaning sieves. The cleaning sieves are located below the threshing apparatus to receive the grain and other materials expelled from the threshing apparatus. The oscillation of the sieves arranges the material in a crop mat or veil on top of the sieve. By forcing a stream of air upwardly through the sieve, chaff, straw and other lighter material in the crop material mat is separated from heavier grain, and the chaff, straw and other lighter material is directed out through the rear end of the combine by the air flow. The heavier seeds or grain fall through the sieves for collection.

Developments in modern agricultural combines have led to increased power and output demands, such

that cleaning system capacity has been and continues to be a limiting factor to performance of the combine. A readily achieved method of increasing combine efficiency is to increase the size of the cleaning area and the
5 sieves to spread the crop material across a wider area and in a thinner crop mat or veil. However, it has been found that increasing the width of the cleaning area requires increasing the width of the combine. Because of the width of fence openings and the size of doors of
10 equipment storage buildings and the like, increasing the width of a combine beyond current limits presents significant problems.

Transverse or cross flow blower fans are particularly useful in combination with combine cleaning
15 sections because they conserve space and produce a wide stream of air that is directed upwardly toward the cleaning sieves of the cleaning section. Because the fan in an agricultural combine is disposed closer to the ground over which the combine moves, increasing fan
20 diameter so as to decrease ground clearance would be undesirable.

Thus, what is sought is a cross flow fan construction capable of providing increased and enhanced air flow capability required for a larger cleaning
25 system of a combine, but which overcomes many of the problems and shortcomings set forth above.

Summary Of The Invention

What is disclosed is a fan for a cross flow
30 fan assembly which overcomes many of the problems and shortcomings set forth above. According to the invention, the fan includes a plurality of elongate fan blades supported in an axial cylindrical pattern about a rotational axis by disk shape fan blade mounting members
35 located adjacent ends of the blades. The fan blades

have radial outer end portions defining an outer diameter of the fan, radial inner end portions opposite the radial outer end portions, and curved intermediate portions between the radial outer end portions and the radial inner end portions, respectively. Each of the fan blades is preferably oriented such that the radial outer end is at about a 28° angle to a line tangent to the fan diameter at the outer end portion thereof, and the radial inner end portion is directed radially inwardly directly toward the axis or such that a line tangential to the radial inner end portion will pass through the axis. Also preferably, the fan has a diameter of about 15.5 inches, 40 blades, and spacing between radial outer ends of adjacent ones of the blades of about 2.375 inches. A preferred depth of the blades as measured between the radial outer end portion and the radial inner end portion thereof is about 2.5 inches, and the blade curvature has a radius of about 2 inches. Also preferably, the fan includes two sets or ranks of the fan blades in end-to-end relation and skewed toward their common ends. The common ends are received in and supported by a single fan blade mounting member in alternating relation one to the other.

Brief Description Of The Drawings

Fig. 1 is a side view of an agricultural combine including a fan for a cross flow fan assembly according to the invention;

Fig. 2 is an enlarged perspective view of the fan of Fig. 1;

Fig. 3 is an enlarged end view of the fan of Fig. 2, showing fan blades supported in a fan blade mounting member of the fan;

Fig. 4 is an enlarged fragmentary end view of the fan, illustrating spacing between the fan blades; and

Fig. 5 is an end view of a fan blade of the fan, showing various parameters thereof.

Detailed Description Of The Invention

Referring now to the drawings, in Fig. 1, a representative agricultural combine 10 including a cross flow fan 12 constructed and operable according to the teachings of the present invention, for directing a flow of air, denoted by the arrows, upwardly through sieves 14 and 16 of a cleaning system 18, is shown. Cross flow fan 12 is located in a lower region of a chassis or frame of combine 10, generally beneath a threshing system 20, and the flow of air is directed toward sieves 14 and 16 by guides of sheet metal or other material (not shown) in the well known manner.

Referring also to Fig. 2, cross flow fan 12 includes a plurality of elongate fan blades 22 supported and held in an axial cylindrical, skewed pattern about a central rotational axis 24, by a plurality of axially spaced disk shape fan blade mounting members 26, supported on an axially extending shaft 28.

Referring also to Fig. 3, each fan blade mounting member 26 is preferably of molded construction of metal or plastics material, and includes a plurality of curve shape axially facing fan blade mounting grooves 30 therein at angularly spaced locations around axis 24. Each mounting groove 30 is adapted for receiving a fan blade 22 therein and includes a detent tab 32 receivable in a hole (not shown) in a fan blade 22 inserted into groove 30, for retaining the blade therein. Mounting member 26 in Fig. 3 is shown including fan blades 22 mounted in alternating ones of mounting grooves 30,

which is representative of the four fan blade mounting members 26 closest to the axial ends of fan 12. Fan blade mounting member 26 at the middle of fan 12 is different, in that each of mounting grooves 30 supports
5 a fan blade 22, alternating ones of grooves 30 of that mounting member holding fan blades extending in opposite axial directions, as best shown in Fig. 2. Fan 12 thus includes two sets or ranks of fan blades in end-to-end relation, the common ends being supported by a single
10 mounting member 26. As also shown in Fig. 2, fan 12 preferably has an overall diameter D as measured around radial outer end portions 34 of blades 22 of between about 15 and 16 inches, as denoted by diameter D in Fig. 2.

Referring also to Figs. 4 and 5, the radial outer end portions of adjacent ones of fan blades 22 are preferably spaced apart by between about 2.3 and 2.4 inches, as denoted by distance A in Fig. 4, and radial inner end portions 36 are preferably spaced apart by
20 between about 1.6 and 1.7 inches, as denoted by distance B. Referring more particularly to Fig. 5, each individual blade 22 has a preferred overall width as measured between end portions 34 and 36 of between about 2.5 and 2.6 inches, as denoted at W, and a radius of
25 curvature of between about 2.0 and 2.1 inches, as denoted by radius R. Further preferably, a line tangent to radial outer end portion 34 of each fan blade 22 is oriented at about a 28° degree angle to a line tangent to the outer diameter of the fan at radial outer end
30 portion 34, as denoted by angle C, and a line tangential to radial inner end portion 36 will pass through axis 24, as denoted by line E.

As a result of the above geometrical and dimensional parameters, fan output air volume and
35 pressure are significantly increased without increasing

fan rotational speed, compared to previously used fans. This allows the cleaning system capacity to be increased, without increasing the size thereof.

It will be understood that changes in the
5 details, materials, steps, and arrangements of parts which have been described and illustrated to explain the nature of the invention will occur to and may be made by those skilled in the art upon a reading of this disclosure within the principles and scope of the
10 invention. The foregoing description illustrates the preferred embodiment of the invention; however, concepts, as based upon the description, may be employed in other embodiments without departing from the scope of the invention. Accordingly, the following claims are
15 intended to protect the invention broadly as well as in the specific form shown.